DOCUMENT RESUME

ED 193 072 SE 032 989

AUTHOR Martin, Ralph E., Jr.
TITLE Using Literature to "Teach" Science.
PUB DATE Nov 79
NOTE 11p.; Paper presented at the Annual Conference of the National Middle School Association (Dearborn, MI, November, 1979).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Curriculum Development; Curriculum Enrichment; Elementary Secondary Education; *Interdisciplinary Approach; *Literature; *Science Activities; *Science Curriculum; Science Education

ABSTRACT

Described are several ways literature can be used to teach science. Literature can enhance the learning of science by providing students with more appealing materials which will motivate them to pursue their interests and explore real-life issues. Appealing materials increase student interests in science and stimulate higher-order thinking while increasing the levels at which students read, write, converse, and learn independently. Examples are given of literature integrated into science in the form of one-act plays, periodicals, bibliographies, science fiction, and non-fiction. Literature presents the human side of science and provides opportunities for students to experience issues which frequently confront scientists in real life. (Author/DS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Ralph E Martin, Jr.

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ED193072

Using Literature to "Teach" Science

by

Ralph E. Martin, Jr.
The University of Toledo
Toledo, Ohio 43606

Presented At:

National Middle School Association
Annual Conference
Dearborn, Michigan

November, 1979

SE 032 989

Literature in science? Plays, periodicals, and fiction are examples of literature used to teach science. Why is literature in science class necessary and how is it possible to integrate the two disciplines?

Powers of critical reading and thinking are coveted life skills yet textbooks may often present a somewhat dry picture of science and limit a student's motivation to develop and exercise these skills. [11] Science literature is a viable context through which critical reading and thinking skills can be developed. [8] Subject-matter-related materials that enhance comprehension of science content may be developed by integrating literature into science lessons. As a result, students simultaneously learn science as they develop the life skills of critical reading and thinking in addition to acquiring and practicing decision-making and value/moral reasoning skills. [13]

According to Alvin Toffler, author of Future Shock:

> Our children should be studying Arthur C. Clarke, William Tenn, Robert Heinlein, Ray Bradbury, and Robert Sheckley, not because these writers can tell them about rocket ships and time machines but, more important because they can lead young minds through an imaginative exploration of the jungle of political, social, psychological, and ethical issues that will confront these children as adults. [14]

Toffler urges teachers to consider using materials that are more interesting and appealing to students. Literature is such a source of materials; it captures student interests and compels them to confront and explore real-life issues. Additional benefits include the stimulation of higher-order thinking and increasing the levels of student

reading, writing, talking and independent learning. Literature also enables teachers to present science in a more realistic and human fashion. Appropriate science literature helps students

> to . . . see scientists as human beings, to find ways of communicating with them, to see science as a method of discovery, and make judgments that can be translated into social, political, and personal action. [11]

How can teachers use literature to supplement the teaching of science and what literary forms may be appropriate? The following suggestions may prove helpful.

One-Act Plays

Permit students to exercise their creativity by encouraging them to write one-act plays developed around science concepts or vocabulary included in topics of study. "I Am A Child Of The Universe" [1], a one-act play written about the universe by middle school students, is an example of such an activity. Students study the Big Bang Theory and super novas by acting out stellar relationships. Other students may compose a conversation with a man from Mars. They can discuss dust storms, ice caps, craters, and other martian features. Sound effects may add humor and interest. [3] Given the proper tools, students are motivated to gather facts, organize them, and experience a personal encounter with science.

Periodicals

Science and non-science periodicals frequently contain scientific current events which can be presented to students in interesting and perhaps provocative ways. This form of science news may be used to

inform, develop interests, or enrich students through use in science learning centers.

Science learning centers are locations within the classroom which contain a variety of learning materials. Centers can be developed around students' interests by using an inventory to identify current topics of interest. Refer students to appropriate articles, reports and clippings located in the center as a means of fulfilling and stimulating interests. For example, prepare activity cards or learning center lists in this fashion: If you are interested in the solar system, see Science News, November 3, 1979 [10] or, If you are interested in fear, read about a pill used to combat fright. See Science Digest, November, 1979. [6]

Additional centers can be constructed to enrich students by including provocative statements, short articles, or photographs. One possibility is to ask students questions, provide short answers to those questions, then refer students to the source of information for further study. Two samples follow.

Have you read about the use of artificial blood in humans? After being used to replace nearly 80 percent of the blood in experimental animals, artificial blood is now being used successfully in humans. It was used to save a severely bleeding Japanese man and as a substitute for rare blood types not readily available in the United States. You can read more about this in the December 8, 1979 issue of Science News. [2]

Have you read about the possibility of Old Faithful's steamy eruptions turning to volcanic fire? A huge reservoir of molten rock is believed to lie beneath Yellowstone National Park's geysers. During the past two million years, Yellowstone underwent three vocanic cycles.

Will Old Faithful turn into a volcano? Read about it in the March/April, 1980 issue of Science 80. [5]

Science learning centers may inform, entertain, or motivate students to independently investigate the interaction between their world and science.

Biographies

Use short biographies of famous scientists to present the human side of science. Biographies used to supplement science lessons will encourage interests in otherwise dry material, promote enrichment, break through the artificial barriers between science disciplines, and diminish the aged caucasian male stereotype of the laboratory scientist. Biographies enable students to see scientists as being persons subject to trials, errors, and emotions. Students see scientists for what they really are -- human beings. Consider the following famous scientists and inventors:

Isaac Asimov, Scientist and Science Fiction Writer
James Watson, Biologist
Francis Crick, Physicist and Biologist
Luther Burbank, Plant Biologist
George Washington Carver, Student of Nature
Elizabeth Blackwell, Physician
James Hall, American Geologist
Jacques Cousteau, Oceanographer and Aqualung Inventory
Vilhelm Bjerkness, Weatherman
Marie Curie, The Women Who Discovered Radium
Mary Helen Johnston, Space Scientist
Albert Einstein, Master Scientist
Ann Whitaker, Physicist
Charles Steinmetz, Wizard of Electricity
Robert Goddard, Rocket Inventory
Charles Drew, First Successful Heart Surgeon

For a listing of 200 famous scientists and inventors, see "A Bicentennial Freedom Train of Scientists and Inventors" by Jerome E. DeBruin. [4]

Writing Science Fiction

"Science fiction is a world for dreamers and for people with beautiful imaginations . . . someone like you!" [1] Students learn science while

having fun and develop reading, writing, and critical thinking skills while using science fiction. Try the following activities.

Select a short science fiction story, one that contains several science concepts. Eliminate the end of the story. Direct students to read the story, identify important science concepts, and make use of those concepts, in some interesting way. As students dream up an ending for the story, encourage them to be creative, provide illustrations, create new characters, or add new lines.

Encourage students to create their own science fiction. Some may complain that they don't have any ideas. Inventing ideas for science fiction depends upon one's imagination. New ideas are usually the result of combining old ideas in new ways. Students may experience the process of idea invention in the following ways: [1]

1. Select two old ideas that don't seem to go together. Combine them to make a third new idea.
2. Select an object, any object. Invent a substitute for it. Share your invention with a friend and evaluate it's usefulness together.
3. Think of a way to do some of the following and predict uses for your new technique: bend a rock, stop a light ray, float a skyscraper, break a glass with water.
4. Cut pictures of popular characters out of a magazine. Use one or more to create a story, play, poem, or comic strip. Use the pictures to illustrate as well as create.

Synthesis of Science Fiction and Non-Fiction

Science fiction is an interesting medium which may be used to investigate non-fictional, real-life issues facing students. Classic

works of science fiction were written in the not too distant future. For some, that future is now and for others, the future is soon to arrive.

Science fiction may motivate students to read, critically think, and make decisions in terms of current scientific and social reality. For example, Chapter Five of Mary Shelley's Frankenstein presents the creation of life in Dr. Frankenstein's laboratory and the unexpected outcomes of such a creation. [12] Students may use the fictional setting of Frankenstein to raise many ethical and moral issues useful when examining current media reports of in-vitro (test-tube baby) clinics. Howard and Rifkin's Who Should Play God? provides a non-fictional account of corporate and scientific efforts to create artificial life and what it means for the future of the human race. [7] The book explores possibilities more sophisticated than test-tube babies and acknowledges the existence of appropriate technology to achieve what is presently considered bizarre by current social standards. Use science fiction as a motivator when studying science non-fiction and ask students "What kind of world is this?" as they consider the following near realities: [7]

> Rights to own and sell new life forms created in corporate laboratories.
>
> Experimentation with changes in the digestive tract so that people, like cows, could eat and digest hay.
>
> Scientists proposing the genetic crossing of humans and plants so that skin, like leaves, would perform photosynthesis.

Over 30 years ago, George Orwell envisioned perhaps the most talked about and feared date of the future -- 1984. [9] Dr. David Goodman, a scientist specializing in research on the future, reports that Orwell's most terrifying forecasts about political and social conditions have not come true. However, a longitudinal study of Orwell's 137 predictions made in 1949 revealed that 80 predictions were true by 1972 and more than 100 were reality by 1978. [15]

Newspapers and magazines frequently carry non-fictional accounts of future developments in science which Orwell correctly foresaw, like: the refueling of planes in flight, missiles similar to cruise missiles accurate enough to strike a city block when launched a continent away, chemical agents capable of defoliating huge areas of vegetation, military space satellites, sensitive microphones and other snooping devices, and remote sensing of the body's vital functions.

Summary

Literature can enhance the learning of science by providing students with more appealing materials which will motivate them to pursue their interests and explore real-life issues. Appealing materials increase student interests in science and stimulates higher order thinking while increasing the levels at which students read, write, converse, and learn independently. Literature integrated into science in the form of one-act plays, periodicals, biographies, science fiction and non-fiction, provides students with additional opportunities to make decisions, form values, and examine the relationships between science and life. Finally, literature presents the human side of science and provides opportunities for students to experience issues which frequently confront scientists in real life.

REFERENCES

1. Abruscato, Joe and Jack Hassard. The Whole Cosmos Catalog of Science Activities. Goodyear Publishing Company, Santa Monica, California, 1977.
2. "Artificial Blood Succeeds In Humans." Science News 116 (23): 391; December 8, 1979.
3. Brandes, Louis G. Science Can Be Fun. J. Weston Walch, Publisher, Portland, Maine. 1979.
4. DeBruin, Jerome E. "A Bicentennial Freedom Train of Scientists and Inventors." Science Activities 13 (3): 25-37; May/June 1976.
5. Hammond, Allen F. "The Yellowstone Bulge." Science 80 1 (3): 68-73; March/April 1980.
6. Hansen, James. "A 'Fear Pill': How It Can Combat Fright." Science Digest 86: 64-67; November, 1979.
7. Howard, Kenneth and Jeremy Rifkin. Who Should Play God? Dell Books, New York, 1977.
8. Greenlaw, Jean. "Developing Critical Reading Through Science Fiction." English Journal 68 (3): 70-71; March 1979.
9. Orwell, George. 1984. Harcourt Brace Jovanovich, New York, 1949.
10. "Planet Week: The Solar System on Parade." Science News 116 (18): 308-309; November 3, 1979.
11. Randall, Alice F. "Scientific Writing Beyond the Textbook." The Science Teacher 45 (5): 18-21; May 1979.
12. Shelley, Mary. "Frankenstein." In The Road To Science Fiction: From Gilgamesh To Wells. James Gunn, Editor. New American Library, New York, N.Y. 1977.

13. Stahl, Robert. "Working With Values and Moral Issues in Content-Centered Classrooms." Science Education 63 (2): 183-194; April 1979.

14. Toffler, Alvin. Future Shock. Bantam Books, New York, N.Y., p. 425, 1970.

15. Woods, Michael. "In 1984, Will Big Brother By Watching?" The Blade, Toledo, Ohio. January 6, 1980.